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Reforming Regulation of Hazardous Waste

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Preface

This report takes a broad and dispassionate look at one of today's most controversial public policy issues — the management of hazardous wastes. Public response to several highly publicized instances of environmental contamination has often been impassioned The resultant Congressional action has reflected the drama of the situation more than the technical problems that must be solved.

The purpose of this report is two-fold: to acquaint the reader with the basic features of the laws regulating hazardous waste, and to suggest improvements in federal activities in order to remedy or alleviate serious waste problems.

In a larger sense, this study attempts to defuse the highly emotional aspects of hazardous waste disposal and analyze the issue as objectively as possible. Its conclusions are straightforward. The problem is complex and the costs involved are huge; hence, the statutes governing hazardous waste need to be both reasonable and flexible.

More fundamentally, unless the American public is prepared to make major and difficult changes in the way in which we produce and consume, the generation of hazardous wastes will continue to present difficult environmental problems.

Murray L. Weidenbaum, Director
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Introduction

The disposal and cleanup of hazardous waste is one of the nation's most pressing environmental problems. Public opinion on hazardous waste sites is clear and straightforward: people do not want to live near them, they do not want the environment threatened by them, and they want hazardous sites cleaned up

This report examines the hazardous waste disposal problem in the U.S., focusing on the two major federal laws regulating how those wastes are generated, stored, transported, treated or disposed of, and cleaned up. On that basis, specific recommendations are made for changes in regulatory policies and practices

Part One analyzes the basic issues in the generation and disposal of hazardous wastes. *Part Two* treats the other end of the problem — cleanup of hazardous waste sites that pose a threat to human health and the environment *Part Three* presents recommendations for a) changes in the basic laws regulating disposal and cleanup, and b) further actions by government and industry.

Federal Laws Regulating Hazardous Wastes

As shown in Table 1, the federal government maintains detailed regulatory control over hazardous and toxic substances. A total of 22 laws govern their use, handling, and disposal. The definition of hazardous or toxic is extremely broad. For example, it includes petroleum products, one of the most common and essential substances in American life.

Two major federal statutes govern hazardous waste. The law controlling the generation, transportation, storage, and disposal of hazardous wastes at existing (or future) waste facilities is the Resource Conservation and Recovery Act of 1976, known as RCRA. RCRA deals with operating facilities, not with closed or abandoned sites. The law provides for: 1) federal classification of hazardous waste; 2) a "cradle-to-grave" manifest (tracking) system for wastes; 3) federal safeguard standards for generators and transporters, and for facilities that treat, store, or dispose of hazardous wastes; 4) enforcement of standards for facilities through a permitting system; and 5) authorization of state programs to replace federal programs. RCRA's basic purpose is to protect groundwater from toxic pollution.

A second law, the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), known as the "Superfund," has different objectives. It authorizes the federal government to take action to remove hazardous substances from active and inactive disposal sites that are dangerous, and to clean up emergency spill situations. CERCLA imposes liability for cleanup on companies whose wastes have contaminated a disposal site. Title II of the

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law established a Hazardous Substance Response Trust Fund ("Superfund"), financed by taxes on crude oil, certain imported petroleum products, 42 chemical "feedstocks" produced by manufacturers, and general revenues from the government. The fund currently stands at $1.6 billion. The House of Representatives has proposed raising an additional $10.2 billion over the next five years. Both this law and RCRA give the Environmental Protection Agency (EPA) broad regulatory and standard-setting powers.[1]

Table 1

FEDERAL LAWS REGULATING HAZARDOUS AND TOXIC WASTES OR SUBSTANCES

Statute	Section of U.S. Code
Comprehensive Environmental Response, Compensation, and Liability Act	42 U.S.C. 9601
Resource Conservation and Recovery Act	42 U.S.C. 6901
Toxic Substances Control Act	15 U.S.C. 2601
Clean Water Act	33 U.S.C. 1251
Clean Air Act	42 U.S.C. 7401
Safe Drinking Water Act	42 U.S.C. 300(f)
Federal Insecticide, Fungicide, and Rodenticide Act	7 U.S.C. 136
Consumer Product Safety Act	15 U.S.C. 2051
Occupational Safety and Health Act	29 U.S.C. 651
Hazardous Materials Transportation Act	49 U.S.C. 1801
Federal Hazardous Substances Act	15 U.S.C. 1261
Uranium Mill Tailings Radiation Control Act	42 U.S.C. 7901
Federal Food, Drug, and Cosmetic Act	21 U.S.C. 301
Poison Prevention Packaging Act	15 U.S.C. 1471
Lead-Based Paint Poisoning Prevention Act	42 U.S.C. 4801
Federal Disaster Relief Act	42 U.S.C. 5121
Marine Protection, Research, and Sanctuaries Act*	33 U.S.C. 1401
Deepwater Ports Act*	33 U.S.C. 1501
Outer Continental Shelf Lands Act*	43 U.S.C. 1801
Intervention on the High Seas Act*	33 U.S.C. 1471
Trans-Alaska Pipeline Act*	43 U.S.C. 1651
Ports and Waterways Safety Act*	33 U.S.C. 1221

Source: U.S. Code.

*Note: These statutes relate primarily to oil as a hazardous substance.

PART ONE: GENERATION AND DISPOSAL OF HAZARDOUS WASTE

The Complexity of the Problem

A 1981 study by the General Accounting Office acknowledged that "the real and potential problems posed by improperly managed hazardous waste sites are enormous." It stated that the problem constitutes "perhaps the single most important environmental issue of the decade."[2] The issues inherent in generating, managing, and disposing hazardous wastes are complex and diverse. This section attempts to clarify some of them.

What are "Hazardous Wastes"?

In a legal sense, the definition of "hazardous waste" in RCRA (42 USC 6901(5)) is very broad. It states that hazardous waste is

> . . . a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics, may (a) cause, or significantly contribute to an increase in mortality or. . . illness; or (b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

This definition is complicated by two factors. First, regulations issued by EPA under RCRA include waste substances that are either liquid or contained in liquids. Most hazardous waste is, in fact, wastewater. Though the operative term in the definition is "solid waste," the definition covers materials that are liquid, semi-solid, solid, or that contain gaseous material. Second, the definition of "improper management" poses special problems. As John Quarles, former general counsel and assistant administrator of EPA, has written, "the implications of basing the definition. . . upon the assumption of improper management. . . leads inevitably to an expansion of jurisdictional coverage." The term "has indeed embraced a broad array of waste materials that differ markedly from each other in their hazard-producing potential."[3]

Identifying materials classified as "hazardous waste" is a complicated process. The basic characteristics are 1) any type of garbage, sludge, or refuse; or 2) material that is discarded or has served its intended purpose as a manufacturing or mining by-product. These substances are either: a) ignitable, reactive, corrosive, or toxic; or b) materials that have been listed by EPA as hazardous waste. The EPA has issued four lists of roughly 400 substances classified as hazardous wastes.[4] There are believed to be hundreds, if not thousands, more materials which could be classified as hazardous according to the above criteria.

Sources of Hazardous Wastes

Almost all aspects of economic activity generate hazardous (or potentially hazardous) wastes—agriculture, industry, government agencies, and consumers. The largest source is various kinds of manufacturing, ranging from food, textile, and lumber production to the manufacture of paper, machinery, and instruments. (See Table 2 for waste estimates of the industrial sector.) The

Table 2

ESTIMATED SOURCES OF INDUSTRIAL HAZARDOUS WASTE

Industrial Source (S.I.C. number)	Percent of total
Chemicals(28)	68
Nonelectrical Machinery(35)	10
Transportation Equipment(37)	6
Metal Related Industries(33,34,36)*	6
Motor Freight Transportation and Warehousing(42)	4
Petroleum and Coal Products(29)	3
All others	3
Total	100

Source: Westat, Inc., *National Survey of Hazardous Waste Generators and Treatment, Storage and Disposal Facilities Regulated under RCRA in 1981,* 1984.

Note: *Includes Primary Metals, Metal Products and Electrical Equipment.

largest single source of waste designated as hazardous is the production of chemicals and allied products. Manufacturing wastes include heavy metals (e.g., mercury, arsenic, cadmium), dyestuffs, residual organics, solvents (e.g., acetone, methanol), particulates (e.g., metal oxides), pigments, oils, and contaminated petroleum distillates.

Other sources of hazardous waste are a) end-use activities, b) unusable, unneeded, or unwanted products, c) wastewater treatment sludges, and d) transportation-related spills. Substances in these categories include unused residual products (e.g., pesticides and their containers), drycleaning fluid, electrical equipment containing hazardous materials, emission control sludges, and acids.[1]

Management of Hazardous Wastes

Management methods for hazardous wastes are also quite varied. The diversity of wastes requires a variety of handling methods. The basic management practices are the following:

1) *Storage* (at least temporarily) in tanks or other containers, lagoons, or other facilities. The nature and quantity of the waste governs how, and for how long, it is stored.

2) *Various kinds of treatment:* a) physical treatment, as in filtration; b) chemical treatment, to change molecular structures; c) biological treatment, causing decomposition; or d) high-temperature thermal treatment, or incineration, of appropriate substances. Incineration is technically a treatment method, though it results in material (ash) that must be disposed of.

3) Methods of *disposal,* which include: a) surface impoundment in pits,

ponds, lagoons, etc.; b) landfills where wastes are placed directly in the ground; c) land treatment, or landfarming, by which wastes are spread and mixed so as to be rendered innocuous; and d) deep well injection. Additional methods are waste piles and ocean dumping. Illegitimate or illegal methods of waste disposal include "midnight dumping" of hazardous substances and road application of wastes mixed with oil. Blending of wastes with heating fuel is now being brought under regulation.

Many treatment and disposal methods are available. The methods chosen depend on the specific kind of material being handled.[6] Table 3 shows the wide range of costs for different methods of waste disposal.

By the end of 1981, about 10,000 hazardous waste storage, treatment, and disposal facilities had reported their activities to EPA. Almost 90 percent of these were treatment and storage sites, but only 13 percent of them (about 1,267) had some disposal capability. A large majority of the facilities use containers or tanks to treat or store waste. About 17 percent use surface impoundments, 6 percent use incineration, and 5 percent use landfills.[7]

Table 3

COSTS OF ENVIRONMENTALLY SOUND METHODS OF HAZARDOUS WASTE DISPOSAL

Method	Cost (dollars per metric ton)
Land spreading	$2-25
Chemical fixation	5-500
Surface impoundment	14-180
Secure chemical landfill	50-400
Incineration (land-based)	75-2,000
Physical, chemical, or biological treatment	Varies

Source: Office of Water and Waste Management, Environmental Protection Agency, *Everybody's Problem: Hazardous Waste,* 1980.

According to EPA, approximately 80 percent of the total volume of waste produced by industry in the U.S. is stored and disposed of by manufacturers at their own factory sites. Most non-industrial generators transport their wastes to commercial disposal and treatment facilities, most of which are landfills. Eighty percent of waste producers ship their wastes to commerical sites, and most of this waste comes from small generators.[8]

The Scope of the Environmental Threat

Millions of metric tons of industrial waste are produced in the U.S. every year. Estimates of the actual quantity generated are not very precise, however. For example, according to an April 1984 study commissioned by EPA, the

estimated quantity of hazardous wastes generated in 1981 falls within a wide range — between 133 and 395 million metric tons. Despite this uncertainty, the same study holds that the quantities of hazardous wastes generated are greater than previously estimated.[9]

Most hazardous waste is not destroyed; it is merely stored. However, a threat to human health is posed only when hazardous waste is improperly managed or when failures occur at storage or disposal sites.

The most widely used methods of storage, treatment, and disposal of hazardous wastes inherently pose dangers to human health and the environment, simply because they do not actually destroy the wastes. Instead, in most cases, wastes are essentially stored. However, a threat is posed only when hazardous waste is improperly managed or when failures occur at storage or disposal sites.

According to the most recent data, EPA has identified 18,000 potentially hazardous waste sites, and it expects ultimately to find 22,000. Some 10,000 have been assessed, and of those, approximately 3,900 require further investigation. EPA placed 538 of the major disposal sites on its National Priority List of hazardous sites, qualifying them for federal assistance for cleanup. In October 1984, EPA proposed placing another 244 sites on the list (some of them federal facilities), to bring the total number of sites requiring attention to 782.[10]

Groundwater Contamination

The most serious threat posed to human health and the environment by hazardous wastes is contamination of groundwater (i.e., subsurface water in aquifers). RCRA is designed primarily to protect this natural resource. Several important features of groundwater are relevant. First, the supply of groundwater in the U.S. is vast—an estimated 33 to 59 quadrillion gallons. Second, the importance of groundwater as a source of drinking water or for industrial and agricultural uses varies geographically. Third, most groundwater moves very slowly, typically at a rate of twenty or thirty feet per year. Its slow movement presents both an advantage and a disadvantage in the event of contamination by wastes: a) one part of an aquifer may be polluted while another part is completely untouched, and b) the slow but steady dispersal of a "plume" of contaminants in groundwater means that an aquifer, once polluted, is likely to remain that way a very long time.

Fourth, knowledge about groundwater is limited, even among experts. Popular understanding of groundwater, therefore, and of the health threat posed by contaminated water, is even more limited. Fifth, pollution of groundwater is more likely to occur from sources other than direct industrial generation. These sources can include contamination by agricultural chemicals, septic tanks, mining operations, highway de-icing salts, and even natural causes.

Finally, testing and monitoring groundwater is both difficult and costly because concentrations measured in only parts per billion may be unaccep-

table for some contaminants. In addition, remedial treatment of contaminated groundwater areas is a massive—and very expensive—undertaking that is hindered by the limitations of available technology for treatment.[11]

Once groundwater is contaminated by a pollutant, the problem is difficult to track. Movement of hazardous waste varies with the nature of the waste itself, soil conditions, weather, groundwater flow rate, and the method of containment. The Council on Environmental Quality has reported that wastes have seemed to remain fairly static in some places; elsewhere, they have moved as fast as two feet a day. In severe cases, the problem can be extraordinary. At a 39-year-old, 17-acre landfill at Islip, N.Y., a leachate plume of waste (leaking from the site) extended one mile, was 1,300 feet wide, and 170 feet deep. The material contaminated roughly 1 billion gallons of groundwater.[12]

The broad scope of the environmental problems concerning groundwater protection has been described by John Quarles in these terms:

> In dealing with problems of groundwater, environmental protection is facing a new frontier. The dynamics of contamination affecting this resource are totally different from those of surface water pollution, air pollution and most other environmental concerns upon which our entire understanding is based. . .We have barely scratched the surface of understanding what groundwater protection is all about.[13]

Major Provisions and Implementation of RCRA

The framework of RCRA provides for comprehensive regulation of hazardous wastes at both the federal and state levels. The law requires the identification and listing of wastes based on factors such as toxicity, persistence and degradability in nature, and the potential for accumulation in tissue. A brief overview of the law's main provisions follows.

Mandatory Standards

RCRA mandates the promulgation of standards for generators of hazardous wastes. Specific regulations cover recordkeeping, labels for containers, disclosure of chemical components, use of a manifest (tracking) system, and reporting to EPA. Similar standards apply to transporters of wastes, in conjunction with the Department of Transportation.

Performance standards are prescribed for owners and operators of waste treatment, storage, and disposal facilities. These standards distinguish between requirements for new and existing facilities and specifically include rules for recordkeeping, reporting, monitoring, inspection, design and construction of facilities, and compliance with permits for treatment, storage, and disposal.

Permitting actions taken by EPA through fiscal 1984 are shown in Table 4. Although the agency acknowledges that issuing permits for hazardous waste facilities is an enormous task, EPA hopes to complete the process by 1992.[14]

Table 4

PERMITTING OF HAZARDOUS WASTE FACILITIES THROUGH FISCAL 1984

Type of Facility	Called In	Issued
Storage and treatment	2274	307
Incinerators	207	16
Disposal facilities	904	13
Total	3385	336

Source: Office of Solid Waste, Environmental Protection Agency.

Permitting Process and Implementation

RCRA's permitting provisions are intended to guarantee that, eventually, all hazardous waste facilities will operate under conditions specified in the permit. However, a "grandfather" clause has allowed existing facilities to operate under "interim status" until a final permit is either issued or denied. [15]

Under rules issued in November 1980, firms and individuals that generate, store, treat, dispose of, or transport hazardous wastes are required to report to the EPA and obtain interim permits to continue operating. Generators are required to store and label wastes in tanks or drums that do not leak, and to keep records. Treatment and disposal facilities are required to plan to "cap" their sites (to prevent water seepage) when filled, provide funds to do this, develop emergency procedures, and monitor any nearby groundwater for possible contamination. Specific operating standards also apply to certain types of facilities. Transporters must prepare manifests for shipped wastes, label the wastes, and clean up any spills. Final standards for storage and treatment facilities were issued by EPA in January 1981; final rules specifically governing incineration facilities were not issued until June 1982; and land disposal permit applications were issued in January 1983, to be effective six months later.

The rules affecting waste storers and treaters require them to use tanks of a specified thickness. Incinerators, however, are under a more stringent requirement to remove 99.99 percent of hazardous wastes. The final rules for new landfills, issued by EPA in January 1983, have the greatest effect, since they require specific liners (made of clay and/or plastic) for these sites, collection systems for leaking waste, and monitoring systems. According to EPA, most surface impoundments of waste currently fail to meet these requirements.

By mid-1983, EPA had initiated the final permit process for less than 1,700 of an estimated 8,800 hazardous waste facilities.

EPA officials, recognizing the dimensions of the task, have estimated that it may take many years to inspect all the hazardous waste facilities that must receive final permits or go out of business. By mid-1983, the agency had initi-

ated the final permit process for less than 1,700 of an estimated, potential total of over 8,800 hazardous waste facilities in the U.S. Nine permits had been granted to new facilities (which cannot be granted interim permits), and no land disposal or incinerator facilities then in operation had been given or denied final permits.

Delays are inherent in the RCRA permitting process. Waste operators, once they have been contacted by EPA, have six months to apply for permits and another 30 days to correct any "incompletions" that EPA identifies. After a public hearing, another 45 days is allowed for the agency to make a "tentative decision." EPA can then take as long as necessary to issue a final permit. [16]

State Programs

RCRA directs the Environmental Protection Agency to issue guidelines that assist the states in developing their own hazardous waste programs which, when equivalent to federal programs, operate in lieu of federal regulation. Under the Reagan Administration, EPA plans to delegate more of the handling of hazardous waste programs to the states. By 1982, a majority of states had received "interim authorization" for such programs. Until a state program is approved, a company must comply with both state and federal requirements for waste management. [17]

Inspection and Enforcement

EPA is authorized to inspect all hazardous waste handlers, including waste generators, transporters, and facilities where wastes are or have been stored. EPA can issue compliance orders and bring suit in U.S. District Courts in the event of violations of laws or regulations. Substantial civil and criminal penalties are also provided. EPA assessed $1.7 million in civil penalties in 1982.

Under amendments to RCRA in 1980, an unusually severe penalty for the offense of "knowing endangerment" was added. The provision provides sanctions against any person who knowingly "places another person in imminent danger of death or serious bodily injury" if the conduct shows "unjustifiable and inexcuseable disregard for human life" or an "extreme indifference for human life." A conviction for this offense can result in a fine of $1 million for a corporation and up to $250,000, plus imprisonment, for an individual. [18]

Summary

The basic features of RCRA are fairly straightforward, bearing little resemblance to the byzantine complexity of other laws such as the Clean Air Act or the Clean Water Act. This did not prevent, however, delays in carrying out the law.

First, unlike other environmental laws, efforts under RCRA to regulate the management of hazardous waste required that complex regulatory mechanisms had to be developed with very little precedent. There were no prior programs or frameworks from which to proceed. Second, technical and scientific problems have continued to hamper progress and generate debate. In the universe of chemicals and substances produced by industry, EPA and others had to identify those which may be considered "hazardous" — and then determine the

amounts of those substances that would pose a threat to human health and the environment. Simply defining what is "hazardous" was and is a chore in itself.

Third, the scope of the hazardous waste problem in the U.S. was not fully understood. In many ways, knowledge is still deficient. The discussion of the complexities of groundwater is just one example of this lack of understanding. Another, to be discussed later, is the limited knowledge concerning the health effects of many substances. As a corollary, no reliable data exist as to which waste problems require the most serious regulatory attention.

Neither EPA nor any existing state agency possesses the expertise or the staffing to tackle the regulatory mandate thrust upon it by Congress.

Finally, neither EPA nor any existing state agency possesses the expertise or the staffing to tackle the regulatory mandate thrust upon it by Congress. The task expected of government, moreover, is formidable: to control, from cradle-to-grave, a vast number of substances produced by countless firms from coast to coast. The federal government was charged to do this under deadlines and through a thicket of litigation at almost every step of the way. [19]

The 1984 Amendments to RCRA

In spite of drawbacks in the basic law, during 1983 and 1984, both the House of Representatives and the Senate worked on amendments to RCRA that would make some aspects of the law more strict. A bill embracing these changes was passed in October 1984 and signed by the President in November 1984.

According to a 1983 House report, one of the primary reasons for action by Congress in reauthorizing RCRA was an estimate that "an amount of hazardous waste equal to that which is currently regulated under RCRA (40 million metric tons per year) is escaping control through various loopholes." The changes were also prompted by a growing desire to end or severely limit land-based disposal of wastes. As stated in the conference committee report on the final bill, Congress intended

> to convey a clear and unambiguous message to the regulated community and the Environmental Protection Agency: reliance on land disposal of hazardous waste has resulted in an unacceptable risk to human health and the environment . . .through the vigorous implementation of the objectives of this Act, land disposal will be eliminated for many wastes and minimized for all others, and . . .advanced treatment, recycling, incineration and other hazardous waste control technologies should replace land disposal.

In a larger sense, the amendments were also enacted as a reaction to the perceived failures of EPA during the Reagan Administration.[20]

Small Quantity Generators

In 1980, EPA conditionally excluded from regulation any generator of hazardous waste which generated less than 1,000 kilograms (one metric ton) of hazardous waste in a calendar month. The 1984 amendments to RCRA have limited that exclusion to generators producing less than 100 kilograms of waste each month. This amount is roughly one half of a 55 gallon drum. This provision affects an estimated 130,000 small generators in the U.S., including a wide variety of small businesses such as drycleaners and gas stations, as well as school science labs. EPA is required to develop regulations for this provision by March 31, 1986.

The new provision brings these businesses into the entire constellation of hazardous waste regulation, for it presupposes that these firms must identify any wastes they produce that fit the definition of "hazardous." It also imposes on them recordkeeping requirements, including the filing of manifest (tracking) reports which must be kept for three years after a disposal facility has received the waste.

It is likely that the small generator of hazardous waste will feel a substantial impact under this change, in terms of disposal and paperwork costs. It may also have the unfortunate result of encouraging some small generators to dispose of waste improperly if the trouble and costs involved become too great. Congress did recognize, however, that the EPA Administrator, in promulgating small-generator regulations, can be flexible in choosing among regulatory approaches as long as the regulations protect human health and the environment.

Land Disposal Restrictions

The most important and far-reaching sections of the RCRA amendments are those which attempt to phase out nearly all land disposal of hazardous wastes. Specific provisions are the following:

1) Prohibits landfill disposal of noncontainerized or bulk liquid hazardous waste.

2) Requires EPA to issue, within 6 months, regulations minimizing (to the extent technologically feasible) landfill disposal of containerized liquid hazardous wastes and to minimize the presence of free liquids in containers.

3) Prohibits landfill disposal of non-hazardous bulk liquids in permitted landfills.

4) Prohibits landfill disposal, within 32 months, of specified hazardous wastes. These specific wastes are the "California list" of high-priority, highly toxic materials.[21]

5) Prohibits landfill disposal, within 24 months, of hazardous wastes containing dioxin.

6) Requires EPA to issue, within 45 months, regulations on disposal of the "California list" wastes, dioxin, and solvents into deep injection wells. If EPA fails to do this in that time period, such disposal will be banned. Other provisions ban underground injection in any area within one-fourth of a mile

of an underground source of drinking water. (See section on "hammer" provisions, below.)

7) Failure of EPA to issue, within 66 months, regulations for any hazardous waste will automatically result in statutory prohibition of land disposal of all listed and identified hazardous wastes.

An obvious goal of these provisions is to prevent future problems with environmental contamination from land-based waste sites. An obvious drawback, however, is that the prohibited waste must go *somewhere* for treatment or disposal. It is likely that the restrictions will cause waste generators to attempt to have more substances incinerated. (Other methods include chemical neutralization and various means of deliquifying or solidifying the wastes.) A study by Arthur D. Little Associates indicates that incineration capacity will have to increase by a factor of six. In 1981, 1.7 million metric tons of hazardous waste were incinerated in the U.S. [22]

The difficulties associated with greatly expanding incineration facilities are far from trivial: 1) incineration is up to 10 times more costly than land disposal; 2) permitting of incinerators poses an obstacle, given regulatory requirements and customary delays—in fact, all current incineration facilities operate under interim permits; 3) public opposition is as strong against the siting of incineration facilities as it is against landfills; 4) incinerators are difficult to maintain properly and safely; and 5) questions arise concerning the environmental impact of air pollution from incinerators.

These provisions come at a time when there is already a significant shortage of safe, reliable waste disposal sites. No new disposal sites have been opened since 1980, and many old sites have been closed. Proposals to open new facilities in various parts of the country have met with strong public opposition.[23]

Minimum Technological Requirements (Retro-fitting)

A major provision of the RCRA amendments requires that all new landfills and surface impoundments of hazardous wastes must have double plastic liners and a leak-collection system, and provisions for groundwater monitoring. These "minimum technological requirements" increase disposal costs significantly. Existing surface impoundments of hazardous waste must comply with these requirements within four years. EPA can modify these rules but only after an operator of a facility meets stringent guidelines for an exemption.

The ramifications of this provision are enormous for the sites to which it applies. The bill does not offer guidance as to how a company should insert the liners and the collection systems under millions of tons of waste. The obvious solution appears to be to move the materials contained at an existing site to another new or existing site, at least temporarily. As stated above, existing facilities are in short supply and no new ones have been opened. Therefore, the retro-fitting requirement presents a serious dilemma. Moreover, most experts are not convinced that the plastic liners will not start leaking eventually.[24] The cost of these requirements is significant. The chemical industry has estimated the total retro-fit price tag at $5 billion.[25]

Burning and Blending of Hazardous Waste

Two minor provisions of the new amendments now regulate the blending of hazardous wastes with fuel oil or waste oil to prohibit uncontrolled disposal either by burning for heating purposes or for dust suppression.

The first of these problems came to light within the past four years, in New York and New Jersey. Partly as a result of higher disposal costs due to tighter regulation under RCRA, illegal wastes were blended with fuel oil as a surreptitious way of disposing of these wastes. Blending of wastes with heating oil has been extremely hard to track because of attempts to circumvent RCRA rules by falsifying manifests.[26] The second problem addressed in these provisions is the one which led to extensive dioxin contamination of soil at Times Beach, Missouri.

Waste Minimization

The amendments require that, as a condition for a RCRA permit as of September 1, 1985, a generator must certify annually a) that he has a program in place to reduce waste generated, to the extent economically practicable, and b) that the proposed method of treatment, storage, or disposal is the one currently available to him that minimizes the threat to human health and the environment. These items must also be certified on the shipping manifests of transported waste. Biennial reports of generators must indicate efforts to reduce the volume and toxicity of wastes and to report the reductions achieved.

The provision offers no guidance as to how generators can reduce the volume and toxicity of their wastes. It does, however, impose substantial new paperwork requirements.

Mandatory Inspections

The amendments require that every hazardous waste treatment, storage, or disposal facility that is required to have a permit must be inspected at least every two years. Allowance is made to explore the possibility of using private-sector inspection programs. This latter flexibility may be important, given the EPA's limited resources.

Underground Storage Tanks

The 1984 amendments mandate restrictions on the use of underground storage tanks, particularly "bare steel" tanks that provide little or no protection against corrosion. EPA must issue regulations for their installation that a) require leak detection systems, inventory control systems, or other methods to detect releases from underground tanks; b) specify tank closure procedures, and c) provide new tank standards and program regulations for all petroleum tanks within 30 months, new tank standards for the remaining regulated substances within 36 months, and new program regulations for the remaining substances within 48 months.

The scope of these regulations is enormous. The Conference Report on the amendments acknowledges that "there are approximately two million underground tanks in the country in which gasoline and other hazardous substances are stored." It states that "approximately 85 percent of these tanks

are made of steel with no corrosion protection" and that, according to petroleum industry experts, "as many as 75,000 to 100,000 underground tanks are leaking and that 350,000 may develop leaks within the next five years."[27]

National Groundwater Commission

The new law also establishes a 19-member National Groundwater Commission and gives it the following duties: a) to evaluate the quality of the nation's groundwater, b) to identify the sources and extent of contamination, c) to assess the need for a groundwater protection policy, and d) to assess state and federal standards for groundwater quality and their ability to preserve and protect fresh water aquifers.

"Hammer" Provisions

Some unusual features of the RCRA amendments are stipulations, such as those mentioned under "Land Disposal Restrictions," stating that, if the EPA fails to issue certain regulations by specified dates, then disposal of wastes will be automatically and entirely prohibited after those dates. These stipulations, known as "hammer" provisions, are strong indications of congressional impatience with, and distrust of, EPA.

The drawbacks of the "hammer" provisions are substantial. First, they fail to recognize the human, technical, scientific, and logistic limitations of promulgating regulations, regardless of how large an agency's budget may be. Second, they inherently place private-sector waste generators and handlers in an unfair position: if the government fails to do the job mandated by Congress, then the private sector must suffer the consequences.

Summary

Regulation of hazardous waste treatment, storage, and disposal under RCRA is now an established fact. With the passage of the 1984 amendments, an expansion of existing regulatory programs has begun.

The industries most directly affected by RCRA have, for the most part, learned to live with its requirements as a "fact of life." Industry objections to the 1984 amendments include the following:

1) The "burden of proof" concept placed on EPA for determining whether land-based disposal of certain wastes is safe. If EPA cannot, or does not, make this determination and issue appropriate regulations, then "hammer" provisions go into effect to ban the land disposal of those wastes. In effect, EPA must prove a negative—that a given waste in a given disposal environment is proven safe. Such a determination by EPA will subject the agency to nearly certain court challenge;
2) The expensive—and difficult to implement—provision under "minimum technological requirements" to retro-fit existing landfill and impoundment facilities, whether or not the facility is leaking;
3) Unclear language in the law as to whether industry is allowed to use methods of disposal tailored to the specific type of waste being handled (i.e., whether landfill of a given waste is allowed while impoundment is prohibited);

4) The "hammer" provisions which institute automatic prohibition of various types of disposal.

Public opinion has emphasized the need for firm federal control of hazardous waste management. However, the analysis here suggests that major obstacles have not been overcome, particularly with regard to new restrictions on land disposal of wastes. Congress has failed to recognize the shortage of safe, reliable disposal facilities—but it has sought to virtually end the most common means of disposal. Unless the production of hazardous material itself is prohibited, the wastes that are an inherent by-product of modern life must be disposed of somewhere, somehow.

Congress has failed to recognize the shortage of safe, reliable disposal facilities—but it has legislated the virtual end of the most common means of disposal.

A former EPA official has characterized the well-intentioned methods of Congress in this way:

> One of the biggest problems we have is Congress writing laws which call for implementation deadlines for when regulations are to be implemented; but no one allows time either before the law is written or before the regulations have to be promulgated to study the problem and get the basic knowledge base established . . . In an effort to get the programs on the road, Congress shot itself in the foot.[28]

PART TWO: CLEANUP OF HAZARDOUS WASTE SITES

The regulatory apparatus of RCRA is geared almost entirely toward current and future management of hazardous wastes. Following several dramatic, highly publicized instances of citizen exposure to abandoned hazardous waste dumps in the late 1970s—particularly that of Love Canal at Niagara Falls, N.Y.— Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 U.S.C. 9601). This law has come to be known as "Superfund."

Under CERCLA, the federal government identifies active and inactive hazardous waste sites nationwide and is authorized to remove waste materials or otherwise take remedial action. This activity is financed by a Hazardous Substance Response Fund, funded by tax levies on oil and oil products, chemical "feedstocks," and general revenues. Over the 1980-1985 period, $1.6 billion will have been raised for Superfund.

Provisions of CERCLA

The law defines "hazardous substance" by incorporating definitions for substances listed in the following environmental statutes: the Clean Water Act, the Solid Waste Disposal Act (including RCRA), the Clean Air Act, and the Toxic Substances Control Act. CERCLA also directs EPA to issue regulations for other substances found to be hazardous when released into the environment. Moreover, EPA must also issue regulations establishing the *threshold quantity* or "reportable" quantity of a hazardous substance release that triggers notification and response under the law. Unless existing EPA regulations specify otherwise, the reportable quantity for a released hazardous substance is one pound.[29]

National Contingency Plan

CERCLA establishes a National Contingency Plan (NCP) which sets forth the procedures and methods to be followed in the event of a release of hazardous substances, pollutants, or contaminants. The procedures apply to the discovery, investigation, evaluation, and removal (where necessary) of hazardous materials. The NCP also includes requirements for analyzing the relative costs of cleanup; criteria for determining the appropriate extent of cleanup; determination of federal, state, and local roles; and means of assuring that the remedial action is cost-effective.

The scope of EPA's cleanup authority is very large, since the key terms in CERCLA—"hazardous substance," "pollutant and contaminant," and "remedial action" — are given broad statutory definitions. Once the agency is authorized to act and appropriate response actions are determined, EPA cannot spend more than $1 million on the cleanup or continue its activity for more than six months unless the affected state has agreed to pay 10 percent of the cleanup cost and has assured all future maintenance. EPA may also determine that removal of hazardous materials at a site, or other remedial action, should

be undertaken by the parties responsible for the release of the substances, thereby avoiding costs to Superfund.

The NCP also requires methods for determining priorities for remedial actions. Therefore, under its "Hazard Ranking System," EPA annually publishes a National Priorities List of at least 400 sites where hazardous substances are known to have been released or where there is a substantial threat of such a release. (As stated earlier, EPA has now listed over 700 sites.) EPA takes five "pathways" of exposure into consideration: (1) the population put at risk; (2) the hazard potential of substances at the sites; (3) the potential for contamination of drinking water; (4) the possibility of direct human contact; and (5) the potential for destruction of sensitive ecosystems.

CERCLA gives broad discretion to EPA in determining the appropriate remedial action to be taken in a specific instance. Criteria for action are flexible within the bounds of cost-effective, environmentally sound remedies that are feasible and reliable from an engineering standpoint. A "no-action' alternative is also provided for cases in which attempting to clean up a site would present more danger to human health and the environment than leaving it alone.

Enforcement, Implementation, and Liability

Under CERCLA, EPA can take injunctive action for sites where there is imminent and substantial danger. Heavy penalties are allowed for failure to comply with an administrative order of the agency. Cleanup sites usually involve more than one company, and often, many firms whose wastes have been disposed of. These companies are held liable for cleanup. Use of monies from Superfund is prohibited if these parties are available to carry out remedial action. Consideration is being given, however, to "mixing" Superfund monies in such cases to cover the costs attributable to parties that are insolvent, unidentified, or recalcitrant. EPA will generally ask these firms to assume collective responsibility and organize themselves for cleanup efforts and their financing. Most of the action being taken at Superfund sites—as much as 70 percent—is being paid for by private companies rather than the government.

CERCLA imposes liability on responsible parties for costs of removal or remedial action, costs of response by other parties or entities, and for damage to, or destruction of, natural resources. Responsible parties can include: owners and operators of vessels or facilities, and former owners and operators of a facility at the time of disposal of wastes; persons who arranged for treatment of the hazardous substances; and persons who accepted substances for transport to a site from which a release occurred. The law imposes no liability for federally permitted releases.

Currently, the liability standard of the law is "joint and several." That is, a single party may be held responsible for all cleanup costs even if other parties are involved. Cases in which this liability may occur are those in which other parties have disappeared or become insolvent, defunct, or bankrupt. Liability attaches to a party, moreover, without regard to fault or negligence. Liability costs are high: for a facility other than a vessel or vehicle, it includes the total of all response costs plus up to $50 million for damages.

As it presently stands, CERCLA imposes no liability for *personal injury* resulting from the release of a hazardous substance. An attempt was made in the 98th Congress, however, to provide for victim compensation (see below).

Superfund Taxes

CERCLA establishes two taxes to be paid into the Hazardous Substance Response Fund:[30]

1) A tax of 0.79 cents a barrel on crude oil received at U.S. refineries, and on petroleum products brought into the U.S. It also applies to crude oil used in, or exported from, the U.S.
2) A tax on 42 listed chemicals sold by manufacturers, producers, or importers of those chemicals. The materials range from acetylene to zinc sulphate, and the taxes range from $0.22/ton to $4.87/ton. The maximum amount that can be raised from this tax is $1.38 billion.

Collection of these funds began on April 1, 1981, and will end on September 30, 1985, unless CERCLA is reauthorized by Congress. Three companies, Arco Chemical, Shell, and Exxon, which are the largest producers of ethylene and propylene, pay 25 percent of the Superfund tax.[31] A total of 12 companies (out of a total of over 700 firms paying into Superfund) pays the bulk of the tax.

A third tax is paid into the Post-Closure Liability Trust Fund. It is levied at the rate of $2.13 a dry-weight net ton of hazardous waste on receipt of the waste at a qualified disposal facility. Collection began September 30, 1983. The Fund assumes liability, under specific circumstances, for disposal facilities that have been closed and appropriately monitored for releases.

Proposals to Expand Superfund

Near the end of the 98th Congress (August-September 1984), both the House and Senate considered separate bills extending CERCLA for another 5 years, through 1990. Work is expected to resume in Congress on amending the Act in 1985. The following sections analyze major features of the proposals.[32]

Expansion of Superfund

Superfund expansion bills in both the House and Senate provided for higher taxes to greatly increase the amount of money available for cleanup of dangerous disposal sites. The House amendments would have raised the Superfund to $10.2 billion through 1990, a six-fold increase over the current $1.6 billion. The Senate bill would have potentially raised the fund to $7.5 billion.

Agreement exists on the need to increase CERCLA funding, though the size of the increase is a subject of debate. Former EPA Administrator William Ruckelshaus has commented, "it is obvious that still more funds are required, and the Superfund Act itself needs to be extended before it expires in September 1985 so we can maintain the crucial momentum of the program." EPA has reported that the government will have to spend at least $8.4 billion and as much as $16 billion to clean up the most hazardous waste sites in the U.S. The Commerce Subcommittee of the House Energy and Commerce Committee has estimated a $20 billion price tag.[33] These estimates are for total costs to be paid

by government and the private sector; thus estimates for Superfund needs are considerably less.

Many industry spokesmen also agree on the need for greater funding. The Chairman of the Chemical Manufacturers Association, an organization with a strong interest in hazardous waste regulation, has stated that more funding will be needed to continue an effective program. The Association would like to see the Superfund tax mechanism changed, however.[14] (See below.)

There is general agreement that more funding is needed for cleanup of toxic waste dumps. If the EPA were to attempt to spend the sums proposed in the House and Senate bills, however, "the program would be a mess."

In spite of agreement on the need for more funding, money alone cannot solve all the problems of "orphan" toxic waste dumps. Though extra funding is needed to take action at more disposal sites than were predicted in 1980, and to do so more quickly than in the past, EPA has stated that it can effectively use only $5 billion in additional money over the next five years. The Congressional Office of Technology Assessment has reported that $6 billion in Superfund money can be properly spent. Ironically, in estimating the costs of requirements contained in the House amendments to CERCLA, EPA found that a total of $14 billion would be called for, rather than $10.2 billion. An EPA official has stated that if the agency tried to spend these larger amounts of money, "the program would be a mess."[15]

The difficulties involved in actually spending the Superfund money appear to stem from the extraordinary complexity of the cleanup task itself, as well as inherent limitations of a federal agency such as EPA. Consider the following points:

1) Contaminated groundwater is found at about half of the Priority List sites. As discussed under RCRA, tackling this problem is very difficult, if not impossible in some cases. Monitoring and cleansing of polluted groundwater must be carried out for 20 or 30 years.[16]
2) Each hazardous site requiring cleanup is different and requires different remedial approaches. Determination of proper action through engineering studies takes time as well as money.
3) If hazardous substances, contaminated soil, etc., need to be removed from a site, questions arise as to where to put them. As stated earlier, there are not enough safe, reliable disposal sites. Congress has not addressed this problem or provided incentives to rectify it.
4) EPA has begun work at about 300 of the Priority List sites. Engineering studies have been made at more than half of these, and cleanup is underway at 120 sites. EPA estimates it can work on 130 priority sites annually and also manage 200 emergency responses each year. The House bill would mandate that EPA must work on at least 150 sites a year and complete remedial action on Priority List sites within five years.[17] Increasing

EPA funding and manpower will not solve the technological and logistical obstacles inherent in the waste disposal problem. In 1985, Superfund staffing at EPA will number 1,357 positions, twice the 1983 level.[18]

The House bill would change the amount of the tax paid by industry to 77 percent of the total. Oil and chemical companies would pay additional taxes of up to $7.8 billion through 1990.

Waste-End and Other Tax Proposals

The amendments to CERCLA proposed by the House would have provided for the development of an alternative means of Superfund taxation. The current method of taxing the feedstocks of oil and chemical firms and using some general revenues would have been supplemented with a "waste-end" tax whereby companies that actually dispose of wastes would have to pay. Since the list of industries represented as responsible parties at Superfund sites includes many businesses that are not subject to feedstock taxes, it seems reasonable to include their participation in the tax. The House proposal would have directed the Treasury Department to draft legislation designed to raise $1.2 billion in revenue from such a tax.

Arguments for and against a waste-end tax have been put forth. The chemical industry has voiced concern over the economic impact on firms that a greatly expanded Superfund would have if it were to rely heavily or exclusively on the existing tax on those firms' feedstocks. The economic impact on presently taxed firms could be substantial. On the other hand, although a waste-end tax was considered in the original 1980 Superfund bill (S. 1480, 96th Congress), it was rejected as unworkable. EPA and the Treasury maintained that such a tax would require 260,000 points of collection, with associated paperwork and administrative burdens for both industry and government.[19]

The feedstock tax was adopted in 1980 because: a) its impact, passed on through a chain of commerce, would be widespread and would raise more money with little disruptive effect; b) it would be easy to administer, applying to specific substances produced by fewer than 1,000 firms; and c) users of the taxed substances would bear the costs of the risks involved. In 1984, Congress reported that "the $7.5 billion level contained in S. 2892. . . should not be drawn exclusively from the current crude oil and feedstock taxing mechanism," although the final Senate bill did not contain a waste-end tax plan.[40]

One advantage of a waste-end tax is that its directness can change behavior. By placing the financial burden on those who actually dispose of hazardous wastes, an incentive is introduced to deal with waste differently. In particular, if ending land-based disposal is a key goal (as it is in the amendments to RCRA), then sufficient tax on that disposal method induces generators and disposers to find other safe means. The tax could also be scaled appropriately so as not to induce illegal dumping of wastes by small generators.

The element of fairness in a waste-end tax is also significant, especially if more money must be raised through Superfund taxes. The chemical and oil industries point out that more of the burden should be placed on actual polluters, such as the electronics, auto, and aircraft industries and steelmakers.

It has been estimated that companies outside the chemical industry have contributed roughly half of the hazardous materials at existing disposal sites. For example, not one manufacturer of the taxed feedstocks was among the top 25 companies that disposed of hazardous wastes at the leaking Stringfellow Acid Pits in California. Twelve of the most heavily taxed companies, including Arco, Exxon, and DuPont, point out that they pay 61 percent of the Superfund tax but produce less than half the hazardous wastes. More important, if used in conjunction with the current tax method, the waste-end tax would help to raise the additional Superfund money needed for cleanup.[41]

One compelling reason in favor of including a waste-end tax in Superfund is the fact that it would help place the burden where the problem truly lies.

On the whole, one compelling reason in favor of including a waste-end tax is the fact that it helps to place the burden where the problem truly lies. By doing so, this form of tax is an incentive either to produce less waste, or to dispose of it in ways that will not present a danger to human health or the environment.

Still, there are drawbacks to the waste-end tax. Collection of the tax could be difficult to administer, requiring assessments of 10,000 to 128,000 companies, depending on what exemptions were allowed. States that have tried the method have had revenue shortfalls, some by as much as 93 percent. This has occurred because states have incorrectly estimated the amounts of waste disposed off-site or the amount recycled or reused.[42]

Concern has also been voiced that if a waste-end tax were too successful in limiting the amount of hazardous waste to be disposed, it would not be able to generate enough funds to clean up existing problem sites. That is, with far less waste to tax, Superfund would receive less revenue. This is one reason why many affected industries want the waste-end tax to be one element in a "reasoned mix" of methods for collecting Superfund money.

Other alternative taxing methods that have been considered by Congress include the following: 1) an increase in the crude oil tax; 2) expansion of the feedstock list to include substances not now taxed but which are found at Superfund sites; 3) changes in feedstock tax rates based on the frequency with which the substances are found at Superfund sites; 4) shifting the tax on certain feedstocks to primary and secondary derivatives of those substances; 5) taxing the transportation of hazardous substances; and 6) expanding the tax base to include broad industrial segments that consume, transport, manufacture, or dispose of hazardous substances.[43]

Congress has also given consideration to tax options that would help correct anti-competitive impacts—particularly adverse effects on the U.S. chemical industry due to the import of chemicals that are not taxed. A Congressional Research Service report to Congress in 1984, however, found that Superfund

taxes had only a minor impact on the industry or were not a major factor in the economic problems of the U.S. petrochemical industry.[44]

In general, it seems clear that if Congress wishes to increase revenues for Superfund, it will have to make a change in tax methods. Though there are some drawbacks in doing so, it appears advisable to incorporate a waste-end tax in the program. One estimate predicts that supplementing the feedstock tax with a waste-disposal tax, at a rate of $50 per dry-weight ton of hazardous waste, would generate roughly $307 million annually.[45]

Victim Compensation Proposals

Proposals in some of the congressional bills to compensate victims of hazardous waste pollution present perhaps the greatest potential problems of any single issue connected with Superfund.

The Senate amendments to CERCLA (S. 2892) contained a proposal to provide $20 million in grants to states for "a program of assistance to individuals suffering injury resulting from exposure to the release of hazardous substances, pollutants, or contaminants." The assistance included death benefits, medical insurance, and group disability insurance. Other compensation proposals have been considered for several years. Some have also been connected with exposure to Agent Orange and with occupational exposure to toxic substances such as asbestos.

Four major compensation bills have been introduced in Congress by Sen. Robert Stafford of Vermont, Rep. John LaFalce of New York, Sen. George Mitchell of Maine, and jointly by Reps. Edward Markey of Massachusetts and James Florio of New Jersey. All four would create "strict liability" and would establish "joint and several" responsibility.

Compensation cases involving exposure at hazardous waste sites present unique difficulties. The number of people affected by contamination generally cannot be determined adequately, and the causal relationship between exposure and resulting illness usually is very difficult to determine. In addition, illnesses can remain latent for many years after actual exposure to many hazardous substances. Furthermore, compensation claims filed by individuals or groups are generally for enormous sums of money.[46]

Several aspects of victim compensation that have been considered by Congress have widespread ramifications. One is the notion of "absolute liability," which means that even though a firm may put non-hazardous material in a waste facility, it could still be held responsible for any adverse effects resulting from contamination caused by the site. Unlimited retroactivity was attached to this concept when it was included in the original version of H.R. 5640.

Another controversial concept that has been considered in victim compensation measures is that of "rebuttable presumption." At present, plaintiffs must provide scientific evidence to prove conclusively that their illnesses resulted from exposure to a specific hazardous or toxic chemical. Rebuttable presumption obviates the need to link the illness with a source by presuming that a preponderance of known facts establishes the link. The evidence is, therefore, considered indirect and "presumed." The burden of proof is then imposed on

the defendant, who must show that his actions did not directly contribute to the plaintiff's illness.

Rebuttable presumption is a faulty concept. It basically relies on a legal notion of guilty until proven innocent that is contrary to the American concept of justice. Given limited medical knowledge of the causes of some illnesses

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"Rebuttable presumption"—presuming that a plaintiff has been harmed by exposure to a hazardous substance unless proven otherwise—could induce an onslaught of compensation suits if included in the new CERCLA legislation.

(particularly forms of cancer), proving innocence is a difficult task. Rebuttable presumption could also induce an onslaught of compensation suits by anyone who has had exposure to hazardous waste, whether or not ill effects have resulted. In addition, the concept could cause a wide range of companies to declare bankruptcy in the face of large numbers of expensive claims, as was the case with Manville Corporation when it was faced with a flood of asbestos-exposure law suits.[47]

A September 1982 study mandated by CERCLA on the victim compensation issue contained a recommendation for the rebuttable presumption concept rather than the need to show any cause-and-effect relationship. The report also recommended a no-fault compensation system, dubbed "Son of Superfund," that would likewise be financed by taxes on feedstocks and a small portion from general revenues. The no-fault system would impose standards of strict liability (i.e., liability without regard to negligence) on firms which handle hazardous wastes. Claimants would be allowed up to three years to file a claim after discovery of injury. The study rejected EPA's estimate that potentially 1.2 million people are exposed to health dangers from hazardous wastes and stated there is not enough information to make an estimate.[48]

General agreement exists that common law in most States makes it very difficult for damages to be recovered in cases of legitimate injury. Affected industries, however, are firmly opposed to the rebuttable presumption concept because of the enormous potential financial liability it would pose, and its potential for large-scale abuse. Industry is also concerned about the use of "joint and several" liability in compensation cases, since one defendant could be made to pay for all damages even in instances where several defendants may be identified. At least in theory, injured parties might be tempted to pursue judgment against the most profitable companies rather than those firms which may be most at fault.

Insurers are concerned about the mixture of no-fault and fault-based solutions, the proposed changes in legal procedure, and the scientific limitations in proving causal linkage. A test case involving insurance firms has already occurred in Minnesota, where one section of the state's Superfund law provides for a strict liability standard if an injury can be traced to the delayed effects of toxic material. Under this "causation" section, a defendant (such as a com-

pany handling hazardous waste) in a toxic test case must prove that it did not cause a worker's injury. A second provision makes some companies that generate toxic waste liable for problems as far back as 1960, and the liability is "joint and several." As a result, the insurance industry has stopped writing personal liability coverage in Minnesota for any damages stemming from "nonsudden" pollution. ("Sudden" pollution would include hazardous substances released from a tank car in a train accident, for instance.)[49]

An additional significant factor in the victim compensation issue is the problem of reliable data on the health effects of various hazardous wastes. The six major categories of hazardous substances—radioactives, flammables, heavy metals, asbestos, synthetic organic chemicals, and acids and bases— behave differently, have different environmental "fates," and can have effects in the environment and on human health that are unique to themselves. Moreover, the concentration at which one substance may be dangerous may differ markedly from dangerous concentrations of other substances. Industry has expressed the need for further and better research on health effects—not only to discover the health effects themselves but also to determine the magnitude of the problem in the environment.[50]

All in all, victim compensation proposals pose special problems and have the potential of becoming an enormous nightmare for a wide variety of affected industries. The insurance costs alone could be staggering. The general counsel of the Office of Management and Budget, Michael J. Horowitz, has remarked, "I know of no greater fiscal threat for the Nineties than the whole question of toxic torts and victims' compensation."[51]

Mandatory Cleanup Standards

Both the House and Senate proposals for amending CERCLA contained provisions for mandatory levels of cleanup at Superfund sites. Language on cost-effectiveness was included in each. Section 108 of H.R. 5640 states that EPA should select "to the maximum extent practicable. . . permanent solutions and alternative treatment technologies or resource recovery technologies that in whole or in part, will result in a permanent and significant decrease in the toxicity, mobility or volume" of hazardous substances. The bill requires cleanup to the level of the most stringent standards specified under other major environmental laws. It allows for consideration of "long-term maintenance costs."

Section 17 of S. 2892 directs EPA to select, "to the extent practicable," remedial actions that "completely remove" released hazardous substances from the environment. It allows consideration of both short- and long-term costs.

Mandatory cleanup standards have two major drawbacks: cost and inflexibility. EPA itself has maintained that uniform standards cannot be strictly applied to hazardous waste sites. Several examples illustrate the problem.[52]

One Superfund site is a part of the Hudson River bed where firms had disposed of polychlorinated biphenyls (PCBs). EPA has reported that dredging the river to meet the standards of the Toxic Substances Control Act—as would be required under new amendments—would stir up the pollutants and create more of a hazard than would be the case without mandatory standards. Since

the river bed has a cover of silt, scientists advised EPA to take action on the river banks and let the bottom clean itself over the next 70 years.

Another case is Waukegan Harbor near Chicago in Lake Michigan. A clean-up to meet the uniform regulatory standards would cost $80-100 million. Meeting less stringent standards that would not affect the health risk assessment would cost $20 million. (Average cost of a site cleanup, however, is $6.5 million.)

A third case in point is the 20-acre French Limited Lagoon near Houston, where several companies that disposed of waste are paying for cleanup of the site rather than Superfund. Arco Chemical, one of the contributors, has estimated that it will spend $5 million to help detoxify the lagoon under present law, but that it would need to spend $25 million if H.R. 5640 were passed.

The need for flexibility in cleanup efforts is essential, since the problems at hazardous sites can call for very different tactics and solutions. Mandatory standards could waste large sums of money, compared to cost-effective alternatives.

Citizen Suit Provisions

Section 116 of Title II of H.R. 5640 included a provision for citizen suits whereby any person can bring civil action against anyone "who is alleged to be in violation of any requirement" of CERCLA, including the United States government and the EPA Administrator. Congressional opponents of this view have pointed out that EPA could be sued whenever it fails to meet a "non-discretionary" duty, which would include adherence to mandatory cleanup schedules. The proposed bill called for EPA to conduct at least 150 on-site remedial actions annually (beginning in fiscal 1987), as well as specified remedial investigations and feasibility studies (RI/FS). EPA has stated it would have difficulty meeting these deadlines. Lawsuits could number in the hundreds under these provisions alone. The agency could spend more time in court defending itself from citizen suits than it spends in actual cleanup efforts.[53]

Summary

Public concern about hazardous waste cleanup virtually assures that Congress will reauthorize CERCLA in 1985. The difficult aspect is assuring that Congress will enact changes that are reasonable, manageable, and in keeping with both the complexity of the problem, and the resources available to deal with it.

PART THREE: RECOMMENDATIONS

This section presents courses of action that would promote the safe management of hazardous waste in an efficient and effective manner. Although the Resource Conservation and Recovery Act has recently been amended, the suggestions here provide direction to EPA in carrying out the Act's provisions. Since the Comprehensive Environmental Response, Compensation, and Liability Act will be on the legislative agenda for the 99th Congress, it is hoped that these recommendations will promote changes in the Act that will make it more reasonable and manageable for both government and industry.

Solutions to the Waste Problem: General Principles

The potential benefits of RCRA and Superfund are apparent to the public—a cleaner and safer environment. The costs are not so obvious, but they can be substantial. In the end, of course, it is not the firms themselves that bear the costs of hazardous waste disposal and cleanup but rather the consumer, since these costs are reflected—but not separately identified—in the prices of products. Two primary principles should be applied to waste disposal solutions under RCRA.

1) Economic incentives, such as pollution taxes, should be used more widely to promote private decision-making responses that promote new (or better) disposal or recovery technologies. This approach will also generate public funds to promote establishment of new, safe disposal sites.

2) The burdensome nature of compliance with disposal regulations should be reduced by minimizing the staggering amount of paperwork currently required.

The administrators of CERCLA should remain concerned with the safe cleanup of existing wastes. Simultaneously, they should also focus on the following three principles governing hazardous waste cleanup.

1) Protect and promote safe, adequate disposal sites and disposal techniques.

2) Foster voluntary cleanup efforts by industry.

3) Promote ways of making existing disposal sites safe for surrounding residents. Compensation for victims should be left to the courts.

Consistent with these broad principles, the following specific recommendations are offered.

Resource Conservation and Recovery Act

1) *Help small quantity generators comply.* EPA must be allowed to use simplified, innovative ways to assist small quantity generators and encourage their compliance with regulations. High costs, especially the "cradle-to-grave" paperwork burden, could prove counterproductive if they deter compliance by these firms.

2) *Supplement land disposal restrictions.* In phasing out land disposal of hazardous wastes, Congress should provide economic incentives to: a) assure an adequate supply of safe land-based facilities, b) encourage alternative technologies for waste disposal, and c) reduce the amounts and types of waste generated.

3) *Replace the requirement to retro-fit existing facilities.* Substitute a three-pronged effort for the recently enacted program of retro-fitting land disposal sites: a) promote the creation of highly secure disposal facilities to which the waste from problem sites could be moved, b) provide direct encouragement of alternative technologies for handling hazardous waste, and c) completely secure those sites that are already contaminated and use them as central depots for wastes.

4) *Minimize wastes.* Congress should offer a "carrot and stick" incentive system to minimize the amounts and toxicity of hazardous wastes. A useful approach would include investment tax credits for equipment involved in processes that reduce hazardous wastes and progressive taxes assessed on the amount of waste production.

5) *Improve regulation of underground storage tanks.* A program of voluntary compliance with recommended standards for the hundreds of thousands of underground storage tanks in the private sector would be more cost-effective than mandatory regulation. As it stands, it is likely that EPA—even if its budget and staffing are greatly increased—will be unable to meet the requirements of this provision.

6) *Repeal the "hammer" provisions.* The hammer provisions—whereby if EPA fails to meet deadlines set in RCRA, the resulting costs are imposed on industry—should be repealed. A better course is to promote use by EPA of private-sector resources for studying hazardous wastes and developing standards for their disposal. This approach is aimed at achieving a goal rather than imposing a deadline.

Comprehensive Environmental Response, Compensation, and Liability Act

1) *Modestly expand Superfund.* The expansion proposed for Superfund should be reduced to more realistic levels. EPA has repeatedly stated that it cannot spend the additional money proposed for cleanup efficiently or effectively. Throwing more money at the hazardous waste problem, without achieving proportionate results, will only discredit the entire effort.

Revising the funding levels of CERCLA will not be enough. Congress needs to address the following problems as well; a) the complexity of hazardous waste cleanup, particularly with regard to groundwater; b) the flexibility required in cleaning up individual sites; c) the shortage of safe, reliable sites to which waste material from "orphan" sites can be sent; and d) the limitations of EPA's resources and scientific knowledge.

2) *Adopt a waste-end tax component.* Adding a waste-end tax element would spread the burden of Superfund more equitably across industries, particularly industries that produce and dispose of wastes. Ideally, it would act as an added economic incentive to reduce production of hazardous wastes.

3) *Use workmen's compensation approach.* Proposals to compensate victims of hazardous waste should be replaced by a limited, short-term program of no-fault compensation for injury along the lines of workmen's compensation. Funding for such a program should come from an extremely broad base of U.S. industries. Scientific and medical research into the linkage between hazardous substances and human health should be pursued. Clear-cut data on this highly complex issue are lacking.

4) *Write flexible cleanup standards.* Standards for cleanup imposed under CERCLA should reflect the need for flexibility in cleanup actions geared to specific sites. The basic and overriding feature should be the ability to tailor a wide variety of approaches to individual problems.

5) *Avoid citizen suits.* Eliminate provisions that allow lawsuits against the government for failing to meet unrealistic deadlines and schedules. Such litigation will hamstring cleanup efforts and deflect resources from the main purpose of CERCLA itself.

Conclusion

John Quarles, former assistant administrator of EPA, has documented the problems experienced by EPA in initiating hazardous waste programs in the latter half of the 1970s. He states that many of the circumstances we face today in promoting safe disposal of wastes are the result of a failure to set priorities under RCRA. Early regulations "reflected a simplistic philosophy of requiring every operator [of a waste facility] to meet a Cadillac standard. . .to ensure there would be zero leakage of contaminants into groundwater" and to retro-fit all existing facilities. EPA finally saw the necessity of tailoring remedial actions to the circumstances of each problem site. Quarles' conclusion is revealing:

> Driven by the forces of environmental politics, we have repeatedly committed ourselves to goals and programs that are utterly unrealistic. By doing so we have deployed regulatory manpower unwisely, diverting limited resources to concerns of marginal importance.[54]

In addition, government has too often responded in a "rubber band" fashion—reacting in haste to public outcry by instituting sweeping programs aimed at real or perceived problems.

The need for regulation of hazardous wastes is universally accepted in the United States. Areas of disagreement, however important, are limited to specific regulatory approaches to the hazardous waste problem. The public's great concern about this issue is not matched by an equal degree of information concerning the complexity and the ramifications of methods proposed for solv-

ing the waste management problem. The scarcity of safe, reliable disposal sites is a major issue not addressed in the current regulatory approach.

This analysis of major changes proposed or enacted in the laws governing hazardous waste disposal and cleanup points out other regulatory shortcomings. For RCRA, Congress has tightened restrictions on disposal, greatly expanded EPA control over hazardous wastes, and imposed deadlines on EPA formulation of regulations. For CERCLA, proposals in Congress would greatly increase Superfund taxes and expand the program into the area of victim compensation.

Though well-intentioned, Congressional actions continue to be characterized by a command-and-control approach. In many cases, inflexible regulations and unrealistic deadlines will merely hamper EPA's and industry's ability to address the real issues.

Though well-intentioned, Congressional actions continue to be characterized by a command-and-control approach. Such actions fail to recognize adequately the overwhelming complexity of the problem. In many cases, inflexible regulations and unrealistic deadlines will merely hamper EPA's and industry's ability to address the real issues.

The legislators' posture towards the regulated industries needs to be re-evaluated. Obviously, some industries bear responsibility in this area, but should they be treated as criminal adversaries? By and large, the hazardous waste management practices carried out in the past were not only legal at the time, but many were also recommended by government.

Even though industry possesses the technology, managerial skills and the money to effectively tackle the problem, the current regulatory environment discourages such action. Given the constant threat of civil and criminal sanctions, with attendant massive financial liabilities, industry lawyers are likely to advise inaction as the safest strategy, at least from a legal standpoint.

Granted, Congress and EPA *should* exert firm and consistent enforcement pressures on prospective illegal waste management and those companies that have little regard for reasonable regulations. However, if sites are to be cleaned up and if waste management practices are to be reformed effectively, a more constructive approach will be necessary.

Ultimately, the challenge for both government and the private sector alike is to better inform the public as to the true nature of the waste management problem. The public ranks hazardous waste sites lower than prisons, mental hospitals, and airports as an acceptable neighbor. The battle cry is now common: "not in my back yard." Highly publicized instances of mismanagement of wastes have given people cause for alarm. Accidents and illegal dumping have provoked an abiding fear of chemicals that will be hard to put to rest.

And yet, no modern economy can exist without producing many undesirable waste products. These materials are inevitable by-products of goods desired by consumers. Even ardent proponents of rigid federal regulation of hazardous

waste recognize that "we have become a society highly dependent on toxic chemicals. We cannot . . . power automobiles, paint houses, grow food, make and dye clothes, or print books without generating substantial amounts of toxic wastes." [55]

Thus, the shortcomings in current federal environmental policies for hazardous wastes are matched by equally important shortcomings in public awareness. The United States can deal with hazardous wastes safely, effectively, and efficiently only if society is properly informed of the trade-offs it faces.

Notes

1. For further details on both RCRA and CERCLA (Superfund), see, for example, John Quarles, *Federal Regulation of Hazardous Wastes: A Guide to RCRA* (Washington, D.C.: Environmental Law Institute, 1982).
2. U.S. General Accounting Office, *Hazardous Waste Sites Pose Investigation, Evaluation, Scientific, and Legal Problems,* CED-81-57, April 24, 1981, p. 1.
3. Quarles, p. 16.
4. For details on definitions, classifications, and excluded substances, see Quarles, Chapter 4.
5. Derived from Quarles, Chapter 2, pp. 15-20.
6. See Quarles, Chapter 2, pp. 20-28. A technical overview is contained in *Technology for Managing Hazardous Wastes,* a report prepared for the New York State Environmental Facilities Corp. by the Rensselaer Polytechnic Institute, September 1979. See also Council on Environmental Quality, *Environmental Quality 1981* (Washington, D.C.: U.S. Government Printing Office, 1982), pp. 101-111; and Samuel S. Epstein, Lester O. Brown, and Carl Pope, *Hazardous Waste in America* (San Francisco: Sierra Club Books, 1982), Chapter 12.
7. *Environmental Quality 1981,* p. 96.
8. Lawrence Mosher, "EPA Still Doesn't Know the Dimensions of Nation's Hazardous Waste Problem," *National Journal,* April 16, 1983, p. 797.
9. Westat, Inc., *National Survey of Hazardous Waste Generators and Treatment, Storage and Disposal Facilities Regulated Under RCRA in 1981* (Rockville, MD: Westat, Inc., 1984), p. 123.
10. William D. Ruckelshaus, "We're Doing Our Best to Protect the Public," *USA Today,* October 10, 1984, p. 10A.
11. See Quarles, pp. 28-35, for a thorough and highly readable discussion of groundwater.
12. Council on Environmental Quality, *Environmental Quality 1979* (Washington, D.C.: U.S. Government Printing Office, 1980), p. 182.
13. Quarles, p. xix.
14. Telephone interview with Office of Solid Waste, Environmental Protection Agency.
15. Council on Environmental Quality, *Environmental Quality 1982* (Washington, D.C.: U.S. Government Printing Office, 1983), p. 118.
16. Mosher, p. 797.
17. *Environmental Quality 1982,* pp. 118-119, 124-5; Quarles, p. 9.
18. *Ibid.,* pp. 119, 126; Quarles, p. 10.
19. Derived from Quarles, pp. 39-47.
20. U.S. Congress, House, Committee on Energy and Commerce, *Hazardous Waste Control and Enforcement Act of 1983,* 98th Congress, 2d sess., May 17, 1983, H. Rept. 98-198, Part 1, p. 19 ff.; and U.S. Congress, Conference Report, *Hazardous and Solid Waste Amendments of 1984,* 98th Congress, 2d sess., October 3, 1984, Rept. 98-1133, p. 80. The summary of the RCRA amendments is derived from the Conference Report. The *Hazardous and Solid Waste Amendments of 1984* bill technically amend the Solid Waste Disposal Act (42 U.S.C. 3251), which was subsequently amended by the

Resource Conservation and Recovery Act of 1976 (P.L. 94-580).

21. For more information on the "California list," see Epstein, Brown and Pope, pp. 349-52.
22. Arthur D. Little, Inc., *New Hazardous Waste Treatment and Disposal Techniques for the U.S.: Applications and Business Opportunities—1983-1993* (Cambridge, MA: Arthur D. Little, Inc., 1984), pp. vi, 2-4.
23. See Tom Alexander, "Hazardous Waste Shuffle on the Hill," *Fortune,* Sept. 17, 1984, p. 137; William D. Buckeley, "EPA's New Rules on Hazardous Wastes Don't Solve Problem of a Scarcity of Sites," *Wall Street Journal,* Nov. 18, 1980, p. 48; and Ronald Alsop, "Widespread Fear of Hazardous-Waste Sites Thwarts State and Industry Disposal Plans," *Wall Street Journal,* March 10, 1983, p. 27.
24. See Alexander, p. 138; Andy Pasztor, "EPA Faces Dilemma on Where to Deposit Toxins It Must Remove From Waste Sites," *Wall Street Journal,* July 12, 1984, p. 29; Cass Peterson, "Toxic Waste: In One Dump, Out the Other," *Washington Post Weekly,* August 13, 1984, p. 31; and Georgette Jasen and Jonathan Kwitny, "Prosecutions of Dumpers of Toxic Waste Underscore the Shortage of Suitable Sites," *Wall Street Journal,* Sept. 2, 1980, p. 42.
25. Estimate provided by Monsanto Company, St. Louis, Mo.
26. Ralph Blumenthal, "Illegal Dumping of Toxins Laid to Organized Crime," *New York Times,* June 8, 1983, p. 1 ff.
27. Conference Report, *Hazardous and Solid Waste Amendments of 1984,* p. 128.
28. Quoted in Epstein, Brown and Pope, p. 311.
29. Material in this section is derived from *Environmental Quality 1982,* pp. 129-133, and Quarles, pp. 171-180.
30. National Association of Manufacturers, *Information Bulletin,* "Comprehensive Environmental Response, Compensation, and Liability Act of 1980," February 1981, p. 10; and Quarles, pp. 177, 180.
31. Shirley Hobbs Scheibla, "Strictly Poison: Big Boost in Store for Taxes on Toxic Waste," *Barron's,* July 23, 1984, p. 31.
32. Derived from H.R. 5640, *Superfund Expansion and Protection Act,* (August 27, 1984); and S. 2892, *Superfund Amendments of 1984* (July 31, 1984). See also U.S. Congress, Senate, Committee on Environment and Public Works, *Superfund Amendments of 1984,* 98th Congress, 2d sess., September 21, 1984, S. Rept. 98-631; U.S. Congress, House, Committee on Energy and Commerce, *Superfund Expansion and Protection Act of 1984,* July 16, 1984, 98th Congress, 2d sess., H. Rept. 98-890, Part 1; and U.S Congress, House, Committee on Ways and Means, *Superfund Expansion and Protection Act of 1984,* August 8, 1984, 98th Congress, 2d sess., H. Rept. 98-890, Part 2.
33. Ruckelshaus, *ibid.;* Philip Shabecoff, "EPA Report Finds Cleaning Up Waste Sites May Cost $16 Billion, " *New York Times,* February 8, 1984, p. 11.
34. "Superfund Will Need More Money to Continue Cleanup Work," *Chemical & Engineering News,* November 28, 1983, p. 15.
35. Rochelle L. Stanfield, "Superfund Backers Push Big Expansion of Program to Clean Up Toxic Wastes," *National Journal,* September 22, 1984,

p. 1762.

36. Ruckelshaus, *ibid.*
37. H.R. 5640, Sec. 112.
38. Ruckelshaus, *ibid.*
39. S. Rept. 98-631, *Superfund Amendments of 1984,* p. 46.
40. *Ibid.,* pp. 46-49.
41. Stanfield, p. 1766; Scheibla, p. 32; Anna Cifelli, "A Modest Proposal to Shore Up Superfund," *Fortune,* October 29, 1984, p. 131; "Clamor for Change in Superfund's Tax Base," *Chemical Week,* April 12, 1984, pp. 12-13.
42. "Bill Aims for Larger, More Comprehensive Superfund," *Chemical & Engineering News,* February 6, 1984, p. 15.
43. S. Rept. 98-631, *Superfund Amendments of 1984,* pp. 49-65.
44. *Ibid.,* pp. 45-46, 65, and Appendix A-2.
45. Edwin C. Holmer, President, Exxon Chemical Co., in "Set Superfund Size to Meet EPA Needs," *Chemecology,* July/August 1984, p. 3.
46. A single instance is illuminating. In October 1984, former residents of Times Beach, Mo., and other dioxin-contaminated sites nearby, filed seven law suits against two companies and their trustees for more than $5.3 billion in damages. The suits represented 354 people, each seeking a minimum of $15 million. They were filed in addition to two other suits filed on behalf of 360 people seeking $5.4 billion in dioxin-related damages, as well as a class action suit seeking millions of dollars in property damages. Additional suits for another 135 people were being prepared. See Tommy Robertson, "Dioxin Suits Ask Damages of $5 Billion, " *St. Louis Post-Dispatch,* October 2, 1984, p. 3A.
47. "Victim Compensation: Paying for the Damage Caused by Toxic Wastes," *Chemical Week,* March 9, 1983, pp. 32-38.
48. *Ibid.;* Laurence Mosher, "A Ticking Time Bomb—Compensation for Victims of Hazardous Waste," *National Journal,* January 15, 1983, pp. 120-1.
49. Eugene Carlson, "Minnesota's Pollution Statute Generates Boycott by Insurers," *Wall Street Journal,* October 23, 1984, p. 33.
50. See James H. Krieger, "More Studies Urged on Health Effects of Hazardous Waste," *Chemical & Engineering News,* June 18, 1984, p. 21.
51. Quoted in Jeremy Main, "The Hazards of Helping Toxic Waste Victims," *Fortune,* October 31, 1983, p. 170.
52. Stanfield, p. 1764; Scheibla, p. 32.
53. See Dissenting Views of the Honorable James T. Broyhill, et al., House Rpt. 98-890, Part 1, pp. 130 ff.; and Dissenting Views of the Honorable Barber B. Conable, et al., house Rpt. 98-890, Part 2, pp. 64 ff.
54. Quarles, pp. xvi-xvii.
55. Epstein, Brown and Pope, p. 343.

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